Appendix E: Supporting Documentation for Watershed Characterization, Part III

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Using Appendix E

The purpose of this appendix is to provide the detailed methods, results, and supporting documentation that are the underpinnings of the main body of the report but to detailed or extensive to report there. This appendix follows the order in which the individual steps are presented in our methods document (Gersib et al. 2004). Individual steps were included in this appendix only if methods were changed or where detailed results needed to be documented.

Identify Target Landscape Areas

Purpose

These steps synthesize watershed characterization information developed earlier to identify landscape areas having the greatest potential to: a) mitigate transportation impacts; b) maximize environmental benefit while reducing mitigation cost; and c) ensure long-term viability of functions mitigated.

Identify Drainage Analysis Units Having "At Risk" Ecological Processes

Methods

Methods used follow criteria established in the detailed methods document (Gersib et al. 2004).

Results

Five ecological and biological processes were characterized under current land cover conditions. Characterization results are presented in the following maps, contained in the main document of the report: Figures 26 and 27, the movement of water; Figures 28 and 29, sediment; Figures 30 and 31, large wood; Figures 32 and 33, aquatic integrity; and Figure 35, upland habitat connectivity. We were unable to characterize the delivery and routing of pollutants and heat for this project. Our inability to characterize the movement of pollutants was the result of limited ambient monitoring data for water quality 303(d) listed water bodies and a lack of other landscape indicators for this ecological process. A model for characterizing the delivery and routing of heat was developed from Poole and Berman (2001), but the lack of available data on stream gradient and stream channel confinement precluded the use and evaluation of this model within project timelines.

An ecological process score was calculated for each potential mitigation site using ArcGIS and displayed in the potential stormwater flow control site priority list (Appendix A) and potential natural resource mitigation site priority list (Appendix B) under the column titled "ENVBENCRIT." Based on the ecological process score, an ecological process rank was established for each potential mitigation site using ArcGIS and displayed in the potential natural resource mitigation site and potential stormwater flow control site priority lists under the column titled "ENVBENRANK."

Identify Drainage Analysis Units With Greatest Potential to Maintain Functions

Methods

Drainage Analysis Unit (DAU) condition ranks for the delivery of water under current and future land use conditions were compared. DAUs that resulting in a change in the overall condition rank for the delivery of water from "at risk" under current conditions to "not properly functioning" under future conditions were identified.

Results

Table E-1 identifies the DAUs that experienced a change in condition rank from current to future land cover conditions. Fourteen of 184 DAUs had a change in ecologi-

cal rank for the deliver of water. Thirteen DAUs changed from “at risk” to “not properly functioning” while one DAU changed from “properly functioning” to “at risk.” Theses changes were incorporated into the final condition rank for the deliver of water and used when prioritized all potential wetland, riparian, and floodplain restoration sites.

Table E-1 Drainage Analysis Units Experiencing Change in Condition Rank for the Delivery of Water.

DAU	Stream Catchment	Revised Condition Rank for Movement of Water
11	North Creek	NPF
39	Sammamish River	NPF
40	Sammamish River	NPF
50	Bear Creek	NPF
51	Bear Creek	NPF
106	Kelsey-Mercer Creek	NPF
114	Lake Sammamish	NPF
115	Lake Sammamish	NPF
117	Lake Sammamish	NPF
129	Lake Sammamish	NPF
130	Lake Sammamish	NPF
133	Lake Sammamish	NPF
136	Lake Sammamish	NPF
182	Issaquah Creek	AR

Identify Local Priority Sites

We consulted draft and completed reports containing watershed priorities for habitat restoration, salmonid recovery, water quantity and base flow improvements, and water quality improvements. Besides containing much valuable background, these were "mined" for lists of local restoration priorities. Each of these documents contains locally-defined proposed projects or targeted stream reaches for water quality enhancement, runoff control, ecosystem recovery, salmon recovery, sediment control, flood amelioration, or similar benefits. Table E-2 is our list of local priority sites.

Later in the watershed characterization process, we matched these lists to our own mitigation site lists, affording higher priority to sites that were also local priorities. GIS analysis of these sites allowed us to find locally-defined proposed projects which are in close proximity to sites we had identified using watershed characterization. These "overlapping" sites are indicated by a "yes" in the "Local Priority" column in Appendices A and B.

Table E-2. Local Priority Sites.

Site ID	Catchment	Project Description	Type	Extent	Citation
63	Evans Creek	Restoration of Johnson Park	Riparian	Point	4
64	Issaquah Creek	Trib 0203 Channel restore	Riparian	Point	2
65	Issaquah Creek	Place LWD in Nudist Park Cr	Riparian	Point	2
66	Issaquah Creek	Riparian Wetland reveg	Riparian	Point	2
67	Issaquah Creek	Riparian Wetland reveg main	Riparian	Point	2
69	Issaquah Creek	Enh Channel Holder Cr	Riparian	Point	2
70	Issaquah Creek	Trib 0199 riparian	Riparian	Point	2
71	Issaquah Creek	Klahanie SW Improve	SW Retrofit	Point	2
72	Issaquah Creek	Ficker tributary revegetate	Riparian	Point	2
73	Issaquah Creek	Kelly's Ranch floodplain rest.	Floodplain	Point	2
74	Issaquah Creek	Place LWD Bianca Mine	Riparian	Point	2
75	Kelsey Creek	Wetland Restore	Wetlands	Point	3
76	Little Bear Creek	Add WQ, Retention/Detention Facs	SW Retrofit	Point	5
77	Little Bear Creek	Add Large Woody Debris at Downstream End	Riparian	Point	5
78	Little Bear Creek	Creek Restoration at Alphine (sic) Rockeries	Riparian	Point	5
79	Little Bear Creek	Flood Buyout and Restoration	Floodplain	Point	5
80	Little Bear Creek	Floodplain Restoration Adjacent to Route 9	Floodplain	Point	5
81	Little Bear Creek	Stormwater Improvements at 156th Street SE	SW Retrofit	Point	5
82	Little Bear Creek	Plant Riparian Vegetation	Riparian	Point	5

Site ID	Catchment	Project Description	Type	Extent	Citation
84	North Creek	Add Conifers to Cascadia Proj. for LWD	Riparian	Point	6
85	North Creek	Floodplain Restoration in Reach 2	Floodplain	Point	6
86	North Creek	Restore Riparian Wetland North of 195th	Wetland	Point	6
87	North Creek	Restore Riparian Wetland S of North Cr PW	Wetland	Point	6
88	North Creek	Floodplain Restoration North of 228th	Floodplain	Point	6
89	North Creek	Enhance Mouth of Palm Creek	Riparian	Point	6
90	North Creek	Enhance Creek in Thrashers Corner Area	Riparian	Point	6
91	North Creek	Expand Twin Creeks Project	Riparian	Point	6
92	North Creek	Continue North Creek School Project	Riparian	Point	6
93	North Creek	Buyout Frequently Flooded Home	Floodplain	Point	6
94	North Creek	Reforest Cleared Parcel	Riparian	Point	6
95	North Creek	North Cr Regional Park Stream Channel Enh.	Riparian	Point	6
96	North Creek	Floodplain Restoration North of Park	Floodplain	Point	6
97	North Creek	Restoration in Native Growth Protection Area	Riparian	Point	6
98	North Creek	McCollum Park Restoration	Riparian	Point	6
99	North Creek	Riparian Restoration and Stream Enhance-ments	Riparian	Point	6
100	Sammamish River	Sam R. mouth wetland restore	Wetland	Point	3
101	Sammamish River	Marymoor re-meander	Riparian	Point	3
102	Sammamish River	Restore meander Willows Run GC	Riparian	Point	3
103	Sammamish River	Enhance trib 0068 confluence	Riparian	Point	3
104	Sammamish River	Enhance trib 0095 confluence	Riparian	Point	3
105	Sammamish River	Enhance trib 0101 confluence	Riparian	Point	3
106	Sammamish River	Enhance trib 0104 confluence	Riparian	Point	3
107	Sammamish River	Enhance Gold Cr. confluence	Riparian	Point	3
108	Sammamish River	Enhance Woodin Cr. confluence	Riparian	Point	3
109	Sammamish River	Enhance Derby Cr. confluence	Riparian	Point	3
110	Sammamish River	Enhance / reconnect wetlands	Wetlands	Point	3
111	Sammamish River	Enhance / reconnect wetlands	Wetlands	Point	8
112	Sammamish River	Enhance / reconnect wetlands	Wetlands	Point	3
113	Sammamish River	Enhance / reconnect wetlands	Wetlands	Point	3
114	Sammamish River	Enhance / reconnect wetlands	Wetlands	Point	3
115	Sammamish River	Restore large wetland mouth Swamp	Wetlands	Point	8

Site ID	Catchment	Project Description	Type	Extent	Citation
116	Tibbetts Creek	Tibbetts Cr relocate / restore	Riparian	Point	2
117	Tibbetts Creek	Tibbetts Manor flood setback	Floodplain	Point	2
118	Issaquah Creek	Guano Acres	Riparian	Point	7
119	Issaquah Creek	Fowler Property	Riparian	Point	7
120	Issaquah Creek	Squak Valley Park	Riparian	Point	7
121	Issaquah Creek	Berntsen Property	Riparian	Point	7
122	Issaquah Creek	Pickering Farm	Riparian	Point	7
123	Issaquah Creek	Bush Lane	Riparian	Point	7
124	Issaquah Creek	Sammamish State Park	Riparian	Point	7
125	Kelsey Creek	Mercer Slough	Wetlands	Point	7
126	Kelsey Creek	Daylight Kelsey Creek	Riparian	Point	7
127	Kelsey Creek	Kelsey Creek Mainstem	Riparian	Point	7
128	Kelsey Creek	West Tributary Stream and Wetland Resto-ration	Wetlands	Point	7
129	Sammamish River	Side Channel Restoration near 102nd St. Bridge	Riparian	Point	7
26	Bear Creek	Bear Cr. floodplain and chan. restore	Riparian	DAU	3
28	Evans Creek	Relocation	Riparian	DAU	4
29	Evans Creek	Restore in place	Riparian	DAU	4
33	Evans Creek	Evans Creek Restoration	Riparian	DAU	4
35	Issaquah Creek	Riparian: Iss. Cr. RM 8.4 to 10	Riparian	DAU	3
36	Issaquah Creek	Holder Cr.	Riparian	DAU	3
37	Issaquah Creek	Carey Cr. Below SR 18	Riparian	DAU	3
38	Issaquah Creek	Carey Cr. Above SR 18	Riparian	DAU	3
39	Issaquah Creek	Iss. Mainstem	Riparian	DAU	3
40	Issaquah Creek	Holder Cr. Carey to SR 18	Riparian	DAU	3
42	Issaquah Creek	Iss Mainstem	Riparian	DAU	3
43	Issaquah Creek	Iss Mainstem	Riparian	DAU	3
55	North Creek	Riparian enhance 164th to SR 524	Riparian	DAU	3
56	North Creek	Floodplain connect 164th to SR 527	Riparian	DAU	3
60	North Creek	Restoration w/i City-Owned Reach of North Cr	Riparian	DAU	6
68	Issaquah Creek	Riparian Wetland reveg Carey	Riparian	DAU	2
27	Bear Creek	Bear / Evans Greenway Project	Riparian	DAU	3
30	Evans Creek	Riparian Restoration	Riparian	DAU	4

Site ID	Catchment	Project Description	Type	Extent	Citation
31	Evans Creek	Pilot Project to Address…	Riparian	DAU	4
34	Issaquah Creek	Place LWD EF Iss. Cr	Riparian	DAU	2
45	Little Bear Creek	Riparian enhance 180th to Maltby	Riparian	DAU	3
46	Little Bear Creek	Riparian enhance south of Maltby R	Riparian	DAU	3
47	Little Bear Creek	Plant Riparian Vegetation	Riparian	DAU	5
48	Little Bear Creek	Restore Riparian	Riparian	DAU	5
49	Little Bear Creek	Add Large Woody Debris in Reach 2 and 3	Riparian	DAU	5
50	Little Bear Creek	Add Large Woody Debris in Reach 4	Riparian	DAU	5
52	Little Bear Creek	Work with Landowners to Restore Riparian	Riparian	DAU	5
53	Little Bear Creek	Restore Riparian Area in Reach 8	Riparian	DAU	5
57	North Creek	Add Large Woody Debris	Riparian	DAU	6
58	North Creek	Riparian Restoration and Stream Enhancements	Riparian	DAU	6
59	North Creek	Riparian Restoration and Stream Enhancements	Riparian	DAU	6
61	North Creek	Riparian Restoration and Stream Enhancements	Riparian	DAU	6
62	North Creek	Riparian Restoration and Stream Enhancements	Riparian	DAU	6
83	Little Bear Creek	Increase Channel Comp. and FP Connectivity	Riparian	DAU	5

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2. King County, 1996. Issaquah Creek Basin and Nonpoint Action Plan. King County Dept. of Natural Resources. Seattle, WA
3. WRIA 8 Steering Committee. 2002. Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Near-Term Action Agenda for Salmon Habitat Conservation. King County Dept. of Natural Resources. Seattle, WA
4. WRIA 8 Steering Committee. 2004. Preliminary DRAFT North Lake Washington Chinook Population - Tier 2 - Initial Habitat Project List. Evans Creek Subarea Reaches 1-7. Unpublished. King County Dept. of Natural Resources. Seattle, WA
5. WRIA 8 Steering Committee. 2004. Preliminary DRAFT North Lake Washington Chinook Population - Tier 2 - Initial Habitat Project List. Little Bear Creek Subarea Reaches 1-12 Plus Great Dane Creek Reaches 1-2. Unpublished. King County Dept. of Natural Resources. Seattle, WA

6. WRIA 8 Steering Committee. 2004. Preliminary DRAFT North Lake Washington Chinook Population - Tier 2 - Initial Habitat Project List. North Creek Subarea Reaches 1-10 (plus Silver and Penny Creeks). Unpublished. King County Dept. of Natural Resources. Seattle, WA
7. I-405 Corridor Environmental Team. 2004. Early Environmental Investments. Washington State Dept. of Transportation.
8. Both numbers 3 and 7 above.

Identify and Prioritize Candidate Mitigation Sites

Purpose

This step identifies the natural resource types to target for restoration and then identifies and prioritizes potential sites having potential to mitigate the unavoidable impacts of transportation projects.

Identify Types of Landscape Features That Provide Mitigation Opportunities

Methods

The interdisciplinary technical team evaluated potential transportation impacts resulting from project improvements to the I-405 and SR520 corridors and used best professional judgment to identify natural resource recovery options having the greatest potential to mitigate transportation impacts and maximize environmental benefits and investments.

Results

The following natural resource restoration/recovery options were identified for mitigating transportation impacts:

- Wetlands
- Floodplains
- Riparian areas
- Stormwater retrofit opportunities

Establish Recovery Themes

When selecting criteria for prioritizing potential wetland, riparian, and floodplain mitigation sites, we chose to incorporate one criteria that reflects the recovery priorities and interests of local jurisdictions and groups.

Methods

An integral part of watershed characterization is the identification and use of locally identified themes. These themes are used, in part, to establish criteria for prioritizing potential mitigation sites, resulting in a mitigation site list that identifies restoration projects capable of meeting our mitigation needs and, at the same time, helping meet local recovery priorities. We develop these based on locally developed documents and from individuals with a detailed knowledge of local stream systems.

Results

Table E-3 summarizes the results of outreach efforts to identify local recovery themes to be used when prioritizing potential wetland, floodplain, and riparian restoration sites.

Table E-3. Local Recovery Themes by Stream Catchment.

Catchment	Primary Local Theme	Secondary Local Theme
Bear Cr.	Sediment	Water
Cottage Lake Cr.	Sediment	Water
EF Issaquah Cr.	Water	Wood
E. L. Sammamish	Habitat	Wood
Evans Cr.	Sediment	Water
Forbes Cr.	Habitat	
Issaquah Cr.	Water	Wood
Juanita Cr.	Habitat	Sediment
Kelsey-Mercer Cr.	Water quality	Water
L. WA - Kirkland	Habitat	
L. WA - North	Habitat	
L. WA - South	Habitat	
Little Bear Cr.	Sediment	Wood
Mercer Slough	Water quality	Water
North Cr.	Sediment	Water
NF Issaquah Cr.	Water	Wood
Richards Cr.	Water quality	Water
Sammamish River	Water	Habitat, Heat
Sturtevant Cr.	Water quality	Water
Tibbetts Cr.	Water	Wood
West L. Sammamish	Habitat	Water
Yarrow Cr.	Habitat	

Sources for Locally Identified Themes:

- Kerwin, J. (2001)
- WRIA 8 Steering Committee (2002)
- Personal communication, Brian Murray, staff for the WRIA 8 Technical Committee, Ann Aagaard, WETnet and League of Women's Voters
- General discussion at meeting with local and state agency staff, etc., 9/9/2004, Seattle. Attendees: Annie Szvetecz, WA Dept. of Ecology; Bob Zeigler, WA Dept. of Fish and Wildlife; Craig Young, Snohomish County Surface Water Management; Greg Stephens, Little Bear Creek Protective Assoc.; Kate Stenberg, US Army Corps of Engineers; Kurt Buchanan, WA Dept. of Fish and Wildlife; Marilu Koschak, NW Indian Fisheries Commission; Sharon Wright, I-405 team; Stephen Sax, WSDOT; Dick Gersib, WSDOT; Tim Hilliard, WSDOT

Identify Candidate Mitigation Sites

Purpose

Methods used follow criteria established in the detailed methods document (Gersib et al. 2004).

Results

Potential wetland, floodplain, and riparian restoration datasets and the stormwater retrofit dataset developed in Part I, Step 3 and presented in Appendices A and B were used as candidate mitigation sites for this project. Results indicate a total of 146 riparian sites, 296 wetland sites, 44 floodplain sites, and 5 stormwater retrofit sites have some potential to serve as mitigation for transportation impacts within the study area.

Develop Priority List of Sites Capable of Mitigating Project Impacts and Minimizing Environmental Investment

Purpose

Rank potential mitigation sites based on each sites opportunity to mitigate transportation project impacts and maximize environmental benefits and investments.

Methods

Methods used follow criteria established in the detailed methods document (Gersib et al. 2004).

Results

A map summarizing the proximity score of each DAU within the study area was developed (Figure E-1, at end of this Appendix). The information is used in the prioritization of stormwater flow control mitigation sites.

A prioritized stormwater flow control mitigation list of potential wetland, floodplain, and riparian restoration sites and stormwater retrofit sites is presented in Appendix A, along with accompanying maps. Detailed site-specific data used to prioritize each site is included on the attached CD. Results indicate that 133 potential wetland, floodplain, riparian, and stormwater retrofit sites meet minimum criteria to be considered a candidate site for the mitigation of stormwater flow control.

A prioritized natural resource mitigation list of potential wetland, floodplain, and riparian restoration sites is presented in Appendix B, along with accompanying maps. Detailed site-specific data used to prioritize each site is included on the attached CD. Results indicate that 486 potential wetland, floodplain, and riparian sites meet minimum criteria to be considered a candidate site for the mitigation of natural resource impacts.

Conduct an Initial Site Assessment of Restoration Potential

Purpose

Gain increased certainty that the highest priority sites, identified primarily with remotely sensed data, have restoration potential.

Methods

Highest priority wetland restoration sites were visited on October 26, 2004 by a wetland biologist and wetland ecologist. All sites were visited and evaluated from public roads or other public access point to gain further insight into each sites restoration potential. Field notes were taken and best professional judgment used to further refine the restoration potential of each site.

Results

A report summarizing findings of site assessment fieldwork on October 26th is presented in Appendix F. Results indicate that this fieldwork was valuable in refining individual restoration site potential and limitations.

Conduct Least-Cost Analysis / Function Comparison of Sites

Purpose

Compile land value and land ownership information on the highest priority wetland restoration sites to support the mitigation site selection process.

Methods

The King County Assessors website was accessed via the internet and site-specific land value and ownership data were compiled for the 12 highest priority wetland restoration sites. All data were compiled in a spreadsheet for comparative purposes.

Results

The spreadsheet developed to compare land values and ownership of the highest priority wetland restoration sites is presented in Appendix F. Results indicate that both appraised land value and the number of landowners varied widely for the 12 highest priority wetland restoration sites. Appraised land values for the highest priority sites ranged from an average of $6,342 per acre to over $169,000 per acre. Ownership data was also quite variable, ranging from a single landowner to one site with 23 separate landowners.

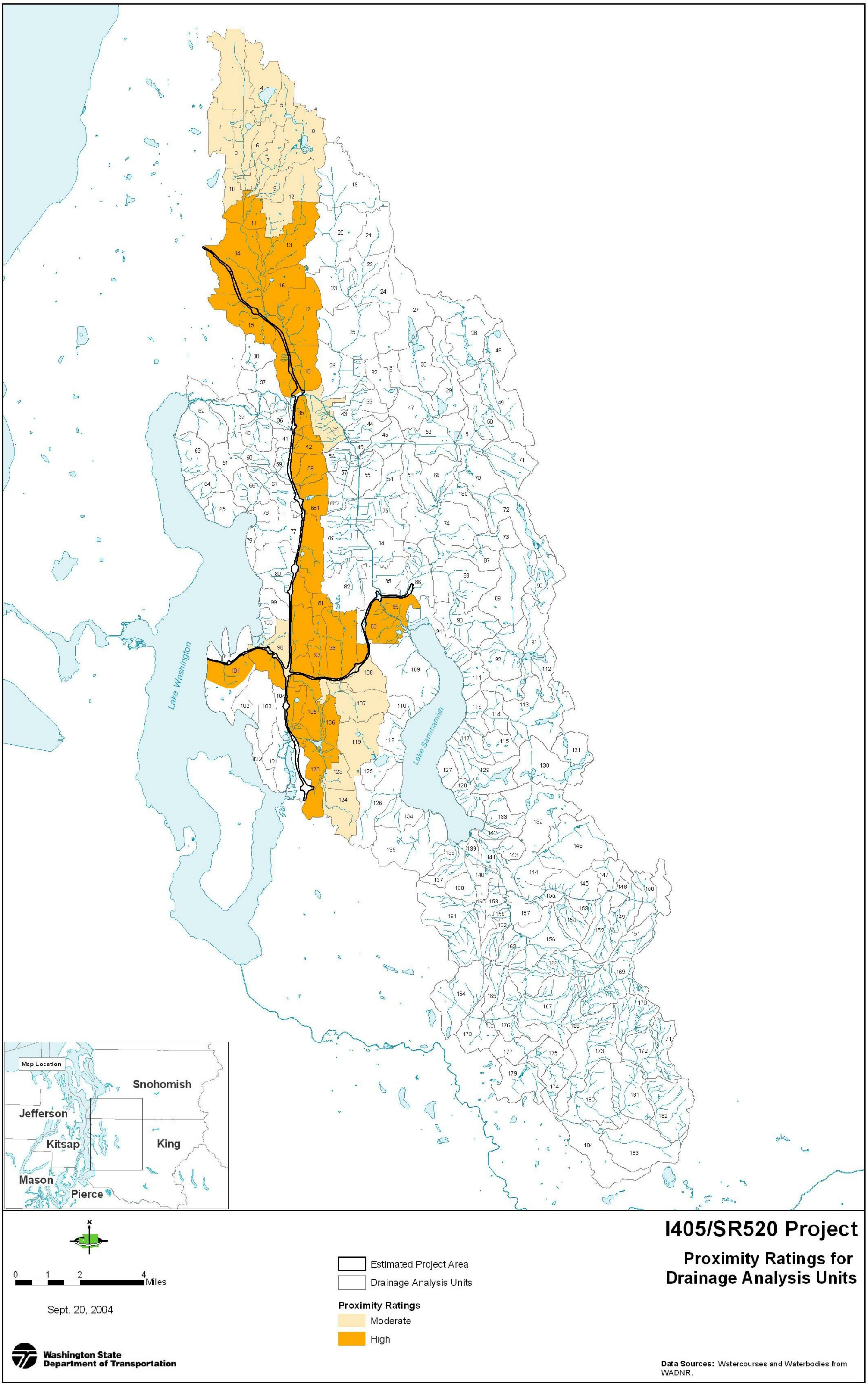

Figure E-1. Proximity Ratings Map by DAU

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